

Math 630 - Linear Algebra and Its Applications

Instructor: Prof. X. Sheldon Wang

Quiz 3 (Closed book)

Assigned: 8:00pm, Mar. 3rd, 2005

Due: 9:00pm, Mar. 3rd, 2005

Problem 1 (25 points)

Find the length of $\mathbf{a} = (2, -2, 1)$ and write down two independent vectors that are perpendicular to \mathbf{a} .

Problem 2 (25 points)

Factor

$$\begin{bmatrix} \cos \theta & \sin \theta \\ \sin \theta & 0 \end{bmatrix}$$

into **QR**, recognizing that the first column is already a unit vector.

Problem 3 (25 points)

Use Gram-Schmidt to construct an orthonormal pair \mathbf{q}_1 and \mathbf{q}_2 from $\mathbf{a}_1 = (4, 5, 2, 2)$ and $\mathbf{a}_2 = (1, 2, 0, 0)$. Express \mathbf{a}_1 and \mathbf{a}_2 as combinations of \mathbf{q}_1 and \mathbf{q}_2 and write down the triangular \mathbf{R} in $\mathbf{A} = \mathbf{QR}$.

Problem 4 (25 points)

(a) Find an orthonormal basis for the column space of

$$\mathbf{A} = \begin{bmatrix} 1 & -6 \\ 3 & 6 \\ 4 & 8 \\ 5 & 0 \\ 7 & 8 \end{bmatrix}.$$

(b) Find the least square solution to $\mathbf{Ax} = \mathbf{b}$, if $\mathbf{b} = (-3, 7, 1, 0, 4)^T$.